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TYPHOID FEVER—METHODS OF TRANSMISSION.

[Advance sheets from Transactions of Third Annual Conference with State Health Authorities.]

At the Third Annual Conference of State and Territorial Health Authorities with the Surgeon-General of the Public Health and Marine-Hospital Service, Washington, D. C., May 15, 1905, among the subjects for general discussion was that of the transmission of typhoid fever. That those who participated in the conference might have ample time to prepare for the discussions, the announcement of subjects was made by Bureau letter of March 31, 1905 (Public Health Reports, April 7, 1905).

In the published transactions of the conference all discussions will appear in full, but in view of the present prevalence of typhoid fever in several of our large cities it is deemed advisable to make the following advance statement of the discussion with regard to that disease. The discussion, which occupied several hours, was participated in by sanitarians of reputation and experience, 22 of whom attended the conference as representatives of 21 States and the District of Columbia.

The statement of Dr. Victor C. Vaughan that two-thirds of the cases in military camps were due to infection by personal contact will be of surprising interest to most sanitarians, and while urban conditions differ widely from those encountered in camps, still the statements of himself and others with regard to personal contact, infected houses, bedding, clothing, eating and other utensils, etc., are pertinent at the present time as showing the means other than water supplies of the spread of this disease in cities.

After announcing the topic for discussion the Surgeon-General called upon Dr. Victor C. Vaughan, of Michigan, stating that the conference was fortunate in having Doctor Vaughan present, as he was one of the members of the commission appointed by the Secretary of War in 1898 to investigate the origin and spread of typhoid in United States military camps during the Spanish war of 1898.

Doctor Vaughan, in responding, stated that he was the sole surviving member of this commission, which, as appointed, embraced Maj. Walter Reed, U. S. Army, Doctor Shakespeare, of Philadelphia, and himself. Remark as to Doctor Reed he felt to be unnecessary in view of the distinction which had crowned his subsequent work on yellow fever; but he felt that a word of appreciation was due Doctor Shakespeare, whose work had been painstaking, thorough, without cessation, and of such an arduous nature that there could be no question that it had shortened his life, and the report of the commission must be regarded as a monument to the skill and devotion of Doctor Shakespeare.

Doctor Vaughan stated that he had formerly held the view that 95 per cent of the typhoid fever was transmitted by drinking water, and as a teacher had so instructed his class for years; in fact, the commission went to the various military camps impressed with the belief that the water supply was at fault; but the experiences and the information collected by the commission had led him to radically change his views. He believed now that the spread of the disease was largely by personal contact. From the observations made by the latter he had reached the conclusion that under the conditions maintaining in military camps, personal contact was responsible for the spread of the disease in about 66⅔ per cent of the cases. Continuing, he stated that the disease (a continued fever) at Camp Alger, 8 miles from Washington, was held by the medical officers in charge, men of skill and experience, to be malarial fever.

The first step taken by the commission at Camp Alger was to have competent men detailed by the Surgeon-General of the Army to examine the blood of patients in each case for plasmodia, and to make the Widal reaction. Dr. James Carroll, of the United States Army, was assigned to this duty at Camp Alger. Doctor Carroll's ability and competence were thoroughly attested by his subsequent work in connection with Major Reed on yellow fever. The result of these examinations was that in only seven or eight instances out of the many hundreds examined at Camp Alger were the plasmodia of malaria found, and an immense majority of these cases held to be malaria at that point gave a positive Widal reaction. Further comment was therefore unnecessary. The disease supposed to be malaria was in reality typhoid.

The commission then went to the camp of the Seventh Army Corps, at Jacksonville, where there were a large number of sick, and where the same mistake in diagnosis obtained—the disease supposed to be malarial fever. The consent of the Surgeon-General was obtained to select 50 cases and to send them to Fort Myer, Va. Upon arrival, these cases were all examined, and all gave the Widal reaction and no plasmodia. One hundred and fifty cases were subsequently selected, sent to Fort Myer, and the same examinations were made with the same result. The condition of the Seventh Army Corps was particularly instructive. The camp was supplied from the city water supply of Jacksonville and contained about 30,000 troops, many of them regulars. The population of the city of Jacksonville was about the same in numbers. The water being the same, the population of the city and the camp approximately the same, there were during the same period in the city of Jacksonville only 7 or 8 cases of the fever.

The commission then visited Chickamauga. The conditions here were terrible. The disease prevailing was again held by some to be malaria; by others it was maintained that the disease was peculiar to the locality. Indeed, medical officers assured the commission, with bated breath, that the disease was incident to the locality, and that Chickamauga meant literally "the river of the death."

The water supply from Camp Alger was derived from driven or bored wells, 100 to 150 feet in depth. The water supply, as has already been related, at Jacksonville was the city water supply, and neither at Jacksonville, at Camp Alger, or at Chickamauga could any typhoid infection of the water be shown.

Doctor Vaughan went on to give more instructive observations as to the course of the disease. He showed that when camps were changed typhoid fever seemed to follow the command by companies, by regiments, and by brigades. An instance was cited by him of a Pennsylvania command, whose camp was frequently changed and which invariably carried its typhoid with it, and this typhoid continued until a thorough disinfection was made of the tents, the blankets, and the personal clothing of the command. Then, and not until then, did the typhoid fever diminish and finally disappear. At Jacksonville and at Chickamauga, and likewise at Camp Alger, the fly was likewise an agent in the dissemination of typhoid, but to a much less extent than has been supposed. Dust was also a factor, the dust, of course, being contaminated with typhoid infection. He was therefore led to the conclusion that typhoid is not only infectious, but is contagious in the ordinary acceptation of the term, and he believed that the result of the observations of the commission showed that disinfection is just as necessary after typhoid fever as it is after diphtheria, scarlet fever, or other contagious and infectious diseases.

The remarks of Doctor Vaughan were listened to with profound attention, and many additional points of information were elicited from him by questions from various members of the conference, to which he replied.

Interrogated as to the disposal of the excreta, Doctor Vaughan replied that the commission had had an opportunity to examine into the details of three methods: At Camp Thomas, Chickamauga, there were troughs, from which the dejecta were washed at intervals by a flow of water; at Jacksonville the excreta were collected in large tubs, which were removed by laborers and transported in carts to a sewer and dumped, and at Camp Alger the regular army latrine, in a trench about 6 feet long, 2 feet wide, and from 4 to 6 feet deep, was in use, the trench being filled with earth as the excreta accumulated.

The Commission was enabled to observe that the percentage of typhoid occurrence was least where the excreta were water-borne, greatest where the tub system was employed, and the camp latrine gave intermediate results. Nor was the reason difficult to understand when the details of the tub system were observed. The removal was irregular; the tubs were often overfilled, and in loading them into the carts the contents were often spilled, so that the route of the carts through the camps could be followed by the excreta upon the ground. Indeed it was often impossible to walk about the camps without soiling the feet by the dejecta, and where lime was employed to sprinkle them in the camp, as was sometimes done, it was easy to see that the flies, with their feet whitened by the lime, crawled over the bread, the potatoes, and other food in the kitchens before it was distributed by the men. But the feet soiled by this dejecta carried this material everywhere and was a prolific source of spread of the disease. To keep the tents free from contamination under the circumstances, was utterly impossible. Again, the dejecta, mixed with the dust of the shell roads, and ground up with it, was carried by the wind, and it was noticeable that camps on the lee side of the roads, exposed to this dust, had more typhoid than the windward side.

Another source of spread was noted at Camp Thomas, and the same conditions undoubtedly obtained elsewhere. A call would be made for a hundred orderlies for hospital duty, and untrained, green men would be supplied. These men, fresh from nursing the sick, from supplying and emptying bedpans and urinals, and from all the intimate personal contact of the nurse with patient, would then be seen marching to their meals, without cleansing of hands, and conveying food to their mouths, and passing food to their comrades, with hands soiled not only with excrement, but with excrement from actual typhoid patients. It sounds incredible, but was nevertheless a fact.

Doctor Smith, of Maine, stated that if we, as sanitarians, had heeded the lessons of experience, the terrible results of disease in the volunteer camps during the war with Spain would not have occurred.

Doctor Young, the secretary of the State board of health of Maine, has been carrying on an investigation for some time, and his results are in striking accord with all which have been detailed by Doctor Vaughan. Doctor Young's information leads to the belief that the infection of hands, of bedding, of towels, and utensils plays an important part in the dissemination of the infection. He suggested that a committee be appointed to collect facts and observations in the matter.

The Surgeon-General stated that there was such a committee—one of the standing committees of the conference—and that the matter would be laid before it during the coming year, for report at the next meeting.

Doctor Harrington, of Boston. stated that recent observations in Germany lead to a belief in the correctness of the views expressed by Doctor Vaughan. He cited the publication of recent observations of an outbreak of typhoid fever occurring in eastern Prussia near the borders of Poland. The region had suffered a period of agricultural depression, but recently important mineral discoveries have been made, and laborers flocked to the site, especially from Poland. An outbreak of typhoid fever occurred, and the water supply, the food supply, and the milk supply formed the subject of investigation, and were found to be above suspicion. All the observations were made by competent observers, and lead to the belief that the spread of the disease was by actual contact from one dirty person to another dirty person, rather than by the heretofore recognized carriers of infection.

Doctor Fulton, of Maryland, dwelt upon the importance of water supply as a method of conveyance. He still believed in it as a carrier of urban typhoid. With suburban or rural typhoid he was of opinion that the matter was one of less import, and that the methods of conveyance were different. In corroboration of the conclusions of Doctor Vaughan, Doctor Fulton quoted the recent instance of the spread of typhoid fever in England by the sale of a large number of infected army blankets from the Transvaal.

Doctor Harrington cited one important method of spread which he thought had been neglected, and that was the dairy farm where typhoid fever prevails. He cited an instance in Massachusetts of a dairy farm where the daily output was about 60 gallons of milk. Investigation showed that several of the employees of this farm were suffering with typhoid. No nurses were employed as such, but the other employees all assisted more or less in the nursing and care of the sick, and went from attention on the sick, sometimes without washing of hands, to the milking of cows. A well-regulated water supply is seldom responsible for the spread of typhoid fever, and 93 per cent of the population of Massachusetts, it is shown by statistics, were supplied by public water supplies. He cited shellfish also as a source of danger, and quoted recorded observations as showing that in a certain population 5 per cent were eaters of shellfish, and gave a typhoid rate of 76 per thousand, as against 56 per thousand in the nonshellfish-eating population. Still more striking, in a shellfish-handling population the rate was 156 per thousand. Shellfish are frequently fattened in water polluted by sewage, and it was impossible any longer to disregard this practice as a source of danger.

Doctor Smith, of Maine, cited the lobster industry of Maine, especially of Portland, as a source of typhoid conveyance. In Portland there are 200 or 300 barrels of lobsters shipped per day. These lobsters are caught and collected all along the coast of Maine and as far north as the Bay of Fundy. They are brought to Portland and are kept in pounds, or floating traps in docks, many of which are in proximity to sewer mouths. So well is this fact recognized that the lobster dealers themselves are in the habit of towing these pounds into deep water every two or three days where the pound and the contained lobsters may be washed in the comparatively pure water of the ebbing and flowing tide. Personally, he could not be induced to eat a pound-kept lobster if he knew it.

Dr. H. D. Holton, of Vermont, cited an instance of an outbreak of typhoid in a school of about 135 inmates. One case developing in the school shortly after the reassembling of the school from vacation led to 13 or 14 cases. The water supply and the milk as supplied to the school were above suspicion, but it was found that the nurses, who were not trained, were in the habit of taking cups, or other drinking vessels, from the sick rooms and filling them from a common milk supply kept in a milk room in another part of the building, and it was found that these milk containers and the milk therein were contaminated with the *bacilli coli* by the hands of the nurses. The regulations of the State board of health of Vermont now require that nurses engaged in the care of typhoid must disinfect bed clothing, drinking vessels, etc., used by typhoid patients, and destroy scraps of food left in the sick room by burning, and must, whenever leaving the chamber of the sick, disinfect their hands by washing with soap and water.

Doctor Lindsley, of Connecticut, reported that there was recently a typhoid epidemic of considerable proportions in a school in Connecticut. The school owned a farm from which were supplied milk, vegetables, and other products used in the school. Examination showed the water supply to be beyond suspicion, but the epidemic continued, and it was discovered finally that the superintendent of the school has employed on the farm a relative who was recently a convalescent from typhoid fever. In this case it would have been beyond doubt that the individual thus employed had carried the infection of typhoid about him in all probability under his finger nails, and had thus communicated it to the milk of the cows which he was employed to take care of.

Doctor Foster, of California, cited instances of transmission of typhoid through a milk supply, the vessels being washed in typhoid-contaminated water. The contamination of streams in California was, unfortunately, quite frequent, through the agency of lumber camps and summer-tourist camps. In almost all camps the latrines were built over running streams where possible, and incubating cases arriving in those camps were bound to contaminate the streams. In addition, California was subjected to another source of danger from her Chinese and Japanese population, who, whatever might be the experiences of the Japanese armies in the Orient, were in California recognized as prone to contract and die of typhoid. This was partially due to their practice of fertilizing their gardens with night soil. They collected night soil whenever and wherever possible and wasted none of it. He regarded water cress as a likely agent to carry typhoid from the manner of its growth in water loaded with organic matter. He believed also in the shellfish propagation of typhoid, having seen clams dug near the mouths of sewers. Oysters were also propagated in beds situated near sewer mouths.

Doctor Souchon asked how the water of cisterns became contaminated with typhoid. In reply, Doctor Simons said that, so far as his city of Charleston, S. C., was concerned, the question was easily answered. The cisterns in that city were of brick and cement and had been cracked by the earthquake of several years ago, and, owing to the unfortunate existence of many cesspools and privy vaults, seepage was easy. Doctor Souchon rejoined that in New Orleans there were 70,000 cisterns, but all above ground, and he could not see how they became contaminated by seepage, but contaminated they certainly were sometimes. It was suggested to Doctor Souchon that the roofs of houses might be the receptacle of typhoid-contaminated dust, or that insectivorous birds might have been feeding on typhoid dejecta, and thus deposit typhoid germs on the roofs with their droppings. To this Doctor Souchon replied that he realized the possibility of the conjectures, but was unconvinced.

Doctor Lewis, of North Carolina, said that all that had been said—and he had been deeply interested– only accentuated the necessity for prompt and efficient disinfection of typhoid dejecta, and that if immediate disinfection was for any reason impracticable, the dejecta should be carefully covered.

Doctor Fulton, of Baltimore, related the instance of typhoid outbreak in the Octagon Cottage, which had acquired quite a local celebrity. This was a school, with separate wings for girls and boys, and was provided with that most dangerous thing, a dual water supply. The water for laundry purposes was from a well that was proved to be contaminated, but a cistern was provided for drinking purposes. Investigation of a very searching character proved, however, that in a time of scarcity of the cistern supply the water from the well had been turned into the tank, which was supposed to contain only cistern water, and sufficiently accounted for the outbreak, which was at first supposed to be unaccountable.

Doctor Vaughan in closing stated that he did not by any means desire to be understood as desiring to exclude the responsibility of water supplies, but cited instances where the infection of typhoid seemed to hang to certain houses, and in which a thorough disinfection of the houses had been followed by a cessation of the disease. He therefore put in a strong plea that typhoid should be considered an infectious and contagious disease, and that every case should be followed by a systematic and rigid disinfection.

It is also pertinent to append here, as bearing upon the same subject, the following resolution passed by the first general International Sanitary Convention of American Republics, Washington, December

2–5, 1902. The resolution was introduced by Doctor Reynolds, health commissioner of Chicago, and adopted unanimously:

> Whereas typhoid fever and Asiatic cholera are caused by swallowing food or drink contaminated by the discharges of previous cases; therefore be it
>
> *Resolved,* That it be recognized by this conference that if all the discharges of every existing case of typhoid fever and Asiatic cholera were instantly disinfected typhoid fever and Asiatic cholera would cease to be a menace to the world.

[Reports to the Surgeon-General, Public Health and Marine-Hospital Service.]

INSPECTION SERVICE, MEXICAN BORDER.

Inspection at Eagle Pass, Tex.

Acting Assistant Surgeon Hume reports as follows:

	Week ended Aug. 12, 1905.
Persons inspected on trains	128
Persons held	0

Inspection at El Paso, Tex.

Acting Assistant Surgeon Alexander reports as follows:

Week ended August 12, 1905, inspection of Mexican Central passengers, 262; inspection of Mexican Central immigrants, 86; inspection of Arabs arriving on Mexican Central, 5; disinfection of soiled linen imported for laundry work, 422 pieces; vaccination of children of immigrants, 3.

Inspection at Laredo, Tex.

Acting Assistant Surgeon Hamilton reports as follows:

Week ended August 12, 1905. Passenger trains entered from Mexico inspected, 14; persons on passenger trains entered from Mexico inspected, 654; immigrants on passenger trains entered from Mexico inspected, 64; immigrants vaccinated upon entry from Mexico, 12; one person 3 days out from Isthmus of Tehuantepec via Tierra Blanca, Mexico, detained until complete necessary period from infected place.

One person 2 days out from Tierra Blanca, Mexico, detained until complete necessary time from infected place.

There are at present very few mosquitoes at this place, owing, I believe, to the high temperature that has been prevailing here for the past two or three weeks.

STATISTICAL REPORTS OF STATES AND CITIES OF THE UNITED STATES, YEARLY AND MONTHLY.

CALIFORNIA—*San Diego.*—Month of July, 1905. Estimated population, 25,000. Total number of deaths, 92, including 7 from tuberculosis.